CURRENT NACA REPORTS

NACA TN 3053

A NEW METHOD OF ANALYZING EXTREME-VALUE DATA. Julius Lieblein, National Bureau of Standards. January 1954. 88p. diagrs., 9 tabs. (NACA TN 3053)

A new method based on order statistics is presented for analyzing extreme-value data. The method of application is presented in detail and an actual example is worked out. The techniques described provide a simple means for estimating the necessary parameters, making predictions from the fitted curve, estimating the reliability, and evaluating the efficiency of the method in relation to methods now in use. Comparison with Gumbel's method of moments indicates that, although subject to certain limitations, the method of order statistics offers certain important advantages. The method is discussed in terms of application to gust loads, but it is also applicable to other fields in which extreme values occur.

NACA TN 3062

A FLIGHT INVESTIGATION OF THE PRACTICAL PROBLEMS ASSOCIATED WITH POROUS-LEADING-EDGE SUCTION. Paul A. Hunter and Harold I. Johnson. February 1954. 42p. diagrs., photos., 4 tabs. (NACA TN 3062)

This investigation was concerned with the effect of atmospheric dust and rain on the clogging of the porous leading edge, power requirements, and construction details. In the course of the investigation, the extent of porous area was varied to determine the effect on power requirements and maximum lift coefficients.

NACA TN 3065

PRESENT STATUS OF INFORMATION RELATIVE TO THE PREDICTION OF SHOCK-INDUCED BOUNDARY-LAYER SEPARATION. Roy H. Lange. February 1954. 16p. diagrs. (NACA TN 3065)

The present status of available information relative to the prediction of shock-induced boundary-layer separation is discussed. Experimental results showing the effects of Reynolds number and Mach number on the separation of both laminar and turbulent boundary layers are given and compared with results obtained by available methods for predicting separation. The flow phenomena associated with separation caused by forward-facing steps, wedges, and incident shock waves are discussed. Applications of the flat-plate data to problems of separation on spoilers, diffusers, and scoop inlets are indicated for turbulent boundary layers.

NACA TN 3066

EFFECT OF SURFACE ROUGHNESS OVER THE DOWNSTREAM REGION OF A 23° CONICAL DIFFUSER. Jerome Persh and Bruce M. Bailey. January 1954. 57p. diagrs., photo. (NACA TN 3066)

An experimental investigation was conducted to determine the effect of increasing the extent of surface roughness over the downstream region of a 23° conical diffuser with a 2:1 ratio of exit to inlet area and with a constant-area tailpipe approximately 3-1/2 inlet diameters in length. The inlet-boundary-layer thickness was of the order of 5 percent of the inlet diameter. The airflows used in this investigation cover an inlet Mach number range from about 0.10 to 0.40, corresponding to Reynolds numbers of approximately 1×10^6 to 4×10^6 based on inlet diameter. The surface roughening was accomplished by coating the surface of the diffuser with graded cork particles. Incremental bands of roughness were removed from the upstream end (a 1-inch-wide band being retained near the inlet to stabilize the flow) after each series of pressure measurements was made so that the variation of diffuser performance with percent of diffuser length roughened could be determined.

NACA TN 3068

COMPARISON OF MODEL AND FULL-SCALE SPIN RECOVERIES OBTAINED BY USE OF ROCKETS. Sanger M. Burk, Jr. and Frederick M. Healy. February 1954. 63p. diagrs., photos., 5 tabs. (NACA TN 3068)

An investigation of a 1/19-scale model of an unswept-wing trainer airplane was conducted in the Langley 20-foot free-spinning tunnel to determine the rocket spin-recovery characteristics of the model for comparison with available full-scale-airplane results. A rocket was attached to each wing tip to fire in a direction to apply an antispin yawing moment about the Z body axis. The rockets were fired individually and in combination.

NACA TN 3069

INCOMPRESSIBLE FLOW PAST A SINUSOIDAL WALL OF FINITE AMPLITUDE. Carl Kaplan. February 1954. 26p. diagrs., 2 tabs. (NACA TN 3069)

Plane incompressible flow past an infinitely long sinusoidal wall of any amplitude is considered in

the present paper. It was found that this problem could not be treated in the physical plane but had to be transferred to the plane of velocity potential and stream function. In this plane, the problem was not only successfully treated by the small disturbance iteration method but, moreover, its solution was rigorously expressed in the form of a nonlinear integral equation.

NACA TN 3095

THE AMES 10- BY 14-INCH SUPERSONIC WIND TUNNEL. A. J. Eggers, Jr. and George J. Nothwang. January 1954. 43p. diagrs., photos., tab. (NACA TN 3095)

The Ames 10- by 14-inch supersonic wind tunnel is described and pertinent features of the design and operation of the facility are included. The wind tunnel is capable of continuous operation at Mach numbers from 2.7 to 6.3 and Reynolds numbers from 1 million to 11 million per foot. Data on the characteristics of flow in the test section, including pressure and stream-angle distributions, are presented.

NACA TN 3098

DENSITY PROFILES OF SUBSONIC BOUNDARY LAYERS ON A FLAT PLATE DETERMINED BY X-RAY AND PRESSURE MEASUREMENTS. Ruth N. Weltmann and Perry W. Kuhns. February 1954. 30p. diagrs., photos. (NACA TN 3098)

Laminar, transitional, and turbulent boundary layers were investigated in a subsonic wind tunnel at Mach numbers of 0.55 and 0.78 at various Reynolds numbers and stations along a flat plate. Comparisons are made of the density profiles obtained with a total-pressure probe of small frontal opening and by means of an X-ray absorption method and, in a few cases, by using interferometer data. The limitations of the probe and X-ray methods are discussed. The decrease in mass flow in the tunnel due to the insertion of the pressure probe was found to affect the pressure measurements in the boundary layer. A mass-flow correction for the pressure data is suggested. The maximum difference between the mass-flow corrected pressure profiles and the radiation measurements was 0.8 percent in density ratio. No change in boundary-layer type from transitional to turbulent or from laminar to transitional was observed when the probe was inserted into the boundary layer.

NACA TN 3101

STUDY OF THREE-DIMENSIONAL INTERNAL FLOW DISTRIBUTION BASED ON MEASUREMENTS IN A 48-INCH RADIAL-INLET CENTRIFUGAL IMPELLER. Joseph T. Hamrick, John Mizisin and Donald J. Michel. February 1954. 64p. diagrs., photos. (NACA TN 3101)

A study of the loss and velocity distribution in a radial flow impeller was made. It is indicated that secondary flows within the boundary layer and leakage through the blade-to-shroud clearance space result in a concentration of low-energy air at approxi-

mately 80 percent of the passage width from the pressure face at the shroud. Comparison of the data from internal measurements made for the impeller of this investigation with hot-wire anemometer studies made at the outlet of a similar impeller indicates that much can be learned about the internal flow picture with hot-wire surveys alone.

NACA TN 3115

ANALYSIS OF SWEPTBACK WINGS ON CAL-TECH ANALOG COMPUTER. Richard H. MacNeal and Stanley U. Benscoter, California Institute of Technology. January 1954. 80p. diagrs., 5 tabs. (NACA TN 3115)

Using the Cal-Tech analog computer, structural analyses have been made of two 45° swept wings of aspect ratio 3. One of these has a constant depth and the other has a constant biconvex cross section in planes parallel to the airstream. The wings extend through the fuselage and are rigidly supported along two lines at the faces of the fuselage. Deflections and all internal forces have been calculated for concentrated static loads. Vibration modes are also presented. The effects of neglecting shearing strains in the ribs and spars and also of assuming the ribs to be rigid have been investigated by modifying the electric circuits to correspond to these simplifications.

NACA TN 3117

LUBRICANTS OF REDUCED FLAMMABILITY. Charles E. Frank, Donald E. Swarts and Kenneth T. Mecklenborg, University of Cincinnati. January 1954. 24p. diagrs., tab. (NACA TN 3117)

Determination of the change in spontaneous ignition temperature with composition for blends of hydrogenated polyisobutylene with typical ester, hydrocarbon, and polyether lubricants has shown that 40 percent hydrogenated polyisobutylene by volume raises the ignition temperature of these lubricants by 60° to 80° C. Preliminary stability tests indicated that the hydrogenated polyisobutylenes possess reasonable thermal stability, suffering a weight loss of about 3 percent after 10 hours at 195° C in an inert atmosphere. Introduction of oxygen accelerates this decomposition rate, but addition of phenyl-beta-naphthylamine reduced the loss to 1 or 2 percent. A practical method for synthesizing polyisobutylene largely in the lubricant molecular weight range has been developed.

NACA TN 3123

EFFECT OF VARIOUS ARRANGEMENTS OF TRIANGULAR LEDGES ON THE PERFORMANCE OF A 23° CONICAL DIFFUSER AT SUBSONIC MACH NUMBERS. Jerome Persh and Bruce M. Bailey. January 1954. 36p. diagrs. (NACA TN 3123)

An experimental investigation was conducted to determine the effect of rough and smooth triangular ledges, approximately one-tenth of the inlet boundary layer thickness in height, on the performance of a 23° conical diffuser with a 2:1 ratio of exit to inlet

area and with a constant-area tailpipe about 3-1/2 inlet diameters in length. The inlet boundary-layer thickness was of the order of 5 percent of the inlet diameter. The airflows used in this investigation covered an inlet Mach number range from about 0.10 to 0.40, corresponding to Reynolds numbers from approximately 1×10^6 to 4×10^6 based on inlet diameter. The rough ledges consisted of graded cork particles and the smooth ledges of balsa-wood strips of triangular cross section. The results of this investigation showed that, although the flow in the diffuser without ledges was very unstable, the presence of a roughness strip near the inlet, with or without additional ledges, assured stable flow. For the configurations investigated, the static-pressure recovery and total-pressure-loss coefficient were either unaffected or slightly impaired by the installation of ledges.

NACA TN 3125

A SIMPLE MECHANICAL ANALOGUE FOR STUDYING THE DYNAMIC STABILITY OF AIRCRAFT HAVING NONLINEAR MOMENT CHARACTERISTICS. Thomas N. Canning. February 1954. 18p. diagrs. (NACA TN 3125)

The analogy between a ball rolling on a suitably contoured surface and a pitching and yawing missile in free flight is developed. The analogue is checked experimentally for the case of linear moment characteristics. Several nonlinear cases are also treated experimentally. Results of ballistic-range firings are also included.

NACA TN 3134

A METHOD FOR ESTIMATING VARIATIONS IN THE ROOTS OF THE LATERAL-STABILITY QUARTIC DUE TO CHANGES IN MASS AND AERODYNAMIC PARAMETERS OF AN AIRPLANE. Ordway B. Gates, Jr. and C. H. Woodling. January 1954. 66p. diagrs., 4 tabs. (NACA TN 3134)

Expressions are presented from which can be calculated the rates of change of the roots of the lateral-stability quartic with respect to the mass and aerodynamic parameters of an airplane. Results obtained from these expressions are compared with the results of exact calculations. The expressions are shown to have a definite relationship to the amplitude coefficients of the lateral modes of motion subsequent to input moments or forces.

NACA TN 3135

INVESTIGATION OF MUTUAL INTERFERENCE EFFECTS OF SEVERAL VERTICAL-TAIL-FUSELAGE CONFIGURATIONS IN SIDESLIP. William H. Michael, Jr. January 1954. 35p. diagrs., photos., 3 tabs. (NACA TN 3135)

This report presents results of sideslip tests made on three circular-arc fuselages and nine unswept vertical tails to determine the mutual interference effects between fuselages and vertical tails. The analysis shows the primary factors affecting the magnitude of the interference effects and the relative

magnitudes of the induced loadings on the fuselage and on the vertical tail. Some observations concerning the distribution of the induced loadings are made. Some theoretical calculations of the interference effect of a body on adjacent lifting surfaces are included and compared with the experimental results.

NACA TN 3140

USE OF AERODYNAMIC HEATING TO PROVIDE THRUST BY VAPORIZATION OF SURFACE COOLANTS. W. E. Moeckel. February 1954. 37p. diagrs. (NACA TN 3140)

The thrust and specific impulse obtainable by use of aerodynamic heating to vaporize aircraft surface coolants are determined as a function of Mach number for a variety of possible coolants. Use of hydrogen vaporization as an independent propulsion system yields specific impulses comparable with those of current rocket propellants at very high Mach numbers. For use as an auxiliary power source, coolant vaporization can produce specific impulses comparable with those of current rocket propellants at all Mach numbers.

NACA TN 3158

A SUBSTITUTE-STRINGER APPROACH FOR INCLUDING SHEAR-LAG EFFECTS IN BOX-BEAM VIBRATIONS. William W. Davenport and Edwin T. Kruszewski. January 1954. 23p. diagrs., tab. (NACA TN 3158)

The use of the substitute-stringer approach for including shear-lag in the calculation of transverse modes and frequencies of box beams is discussed. Various thin-walled hollow rectangular beams of uniform wall thickness are idealized by means of the substitute-stringer approach and the resulting frequencies of the idealized structures are compared with those of the original beams. The results indicate how the substitute-stringer idealization could be made in order to yield accurate representation of the shear-lag effect in dynamic analysis.

NACA TN 3159

FLIGHT INVESTIGATION AT LARGE ANGLES OF ATTACK OF THE STATIC-PRESSURE ERRORS OF A SERVICE PITOT-STATIC TUBE HAVING A MODIFIED ORIFICE CONFIGURATION. William Gracey and Elwood F. Scheithauer. February 1954. 25p. diagrs., photos. (NACA TN 3159)

The static-pressure errors of two essentially similar service pitot-static tubes and of three modified orifice arrangements on one of these tubes have been determined from flight tests over a range of angle of attack α of -15° to 45°, at Mach numbers from 0.20 to 0.68 and at Reynolds numbers from 0.9×10^5 to 2.7×10^5 (where Reynolds number is based on local velocity and the diameter of the tube). The tests showed that for Mach numbers from 0.20 to 0.68 and Reynolds numbers from 0.9×10^5 to 1.4×10^5, the static-pressure error will remain within 2 percent of the impact pressure q_c for $\alpha = -10^\circ$ to 30°. Because of pressure fluctuations

and rapidly increasing errors at $\alpha > 30^o$, the use-
fulness of the tube is limited to $\alpha < 30^o$.

NACA RM E53J08

CORRELATION OF ISOTHERMAL CONTOURS
FORMED BY PENETRATION OF JET OF LIQUID
AMMONIA DIRECTED NORMAL TO AN AIR
STREAM. David B. Fenn. February 1954. 38p.
diagrs., tab. (NACA RM E53J08)

An investigation was conducted to correlate the iso-
thermal contour lines formed downstream of a single
jet of liquid ammonia directed normal to an air
stream. Criteria are presented to facilitate the de-
sign of jet-engine thrust-augmentation systems uti-
lizing the injection of liquid ammonia to cool the air
at the compressor inlet. From the correlation pre-
sented, it is possible to construct an isothermal con-
tour map for a single orifice operating within the
following range of conditions: air velocity, 112 to
329 feet per second; air density, 0.024 to 0.070 pound
per cubic foot; air temperature, 534° to 770° R;
ammonia jet velocity, 63 to 244 feet per second;
ammonia temperature, 433° to 470° R; mixing dis-
tance, 4 to 24 inches; orifice diameter, 0.018 to
0.053 inch. It was verified that the construction of
the isothermal contours formed by a multiorifice in-
jection system may be determined by simply adding
the temperature drops of the overlapping single-
orifice contour maps determined from the correla-
tion.

NACA RM E53K30

FLAME QUENCHING BY A VARIABLE-WIDTH
RECTANGULAR-SLOT BURNER AS A FUNCTION
OF PRESSURE FOR VARIOUS PROPANE-OXYGEN-
NITROGEN MIXTURES. Abraham L. Berlad.
January 1954. 42p. diagrs., 3 tabs. (NACA
RM E53K30)

Flame quenching by a variable-width rectangular-
slot burner as a function of pressure for various
propane-oxygen-nitrogen mixtures was investigated.
It was found that for cold gas temperatures of 27° C,
pressures of 0.1 to 1.0 atmosphere, and volumetric
oxygen fractions of the oxidant of 0.17, 0.21, 0.30,
0.50, and 0.70, the relation between pressure p
and quenching distance d is approximately given by
$d \propto p^{-r}$ with r = 1, for equivalence ratios ap-
proximately equal to one. The quenching equation
of Simon and Belles was tested. For equivalence
ratios less than or equal to unity, this equation may
be used, together with one empirical constant, to
predict the observed quenching distance within 4.2
percent. The equation in its present form does not
appear to be suitable for values of the equivalence
ratio greater than unity. A quantitative theoretical
investigation has also been made of the error im-
plicit in the assumption that flame quenching by
plane parallel plates of infinite extent is equivalent
to that of a rectangular burner. A curve is pre-
sented which relates the magnitude of this error to
the length-to-width ratio of the rectangular burner.

NACA RM E53L01

EXPLOSION AND COMBUSTION PROPERTIES OF
ALKYLSILANES. I - TEMPERATURE-
COMPOSITION LIMITS OF EXPLOSION FOR
METHYL-, DIMETHYL-, TRIMETHYL-,
TETRAMETHYL-, AND VINYLSILANE AT ATMOS-
PHERIC PRESSURE. Rose L. Schalla and Glen E.
McDonald. February 1954. 11p. diagrs. (NACA
RM E53L01)

The explosion limits of five alkylsilanes were deter-
mined as a function of temperature and composition
at a pressure of 1 atmosphere. Over a fuel concen-
tration range of 2 to 10 percent, the lowest temper-
atures (^{o}C) below which explosion did not occur for
the five fuels studied were: tetramethylsilane
$(CH_3)_4Si$, 450°; trimethylsilane $(CH_3)_3SiH$, 310°;
dimethylsilane $(CH_3)_2SiH_2$, 220°; methylsilane
CH_3SiH_3, 130°; and vinylsilane $H_2C=CH-SiH_3$, 90°.
Explosion limits for hydrocarbons analogous to these
silanes fall in a temperature range of 500° to 600° C.
Since the explosion temperatures of the alkylsilanes
are lower than those of the hydrocarbons and since
they decrease as hydrogen atoms are substituted for
methyl groups, it was concluded that the Si-H bond
is more readily susceptible to oxidation than the C-H
bond.

NACA RM E53L08

EFFECT OF WATER ON CARBON MONOXIDE -
OXYGEN FLAME VELOCITY. Glen E. McDonald.
February 1954. 15p. diagrs., 2 tabs. (NACA
RM E53L08)

The flame velocities were measured of 20 percent
oxygen and 80 percent carbon monoxide mixtures
containing either light water or heavy water. The
flame velocity increased from 34.5 centimeters per
second with no added water to about 104 centimeters
per second for a 1.8 percent addition of light water
and to 84 centimeters per second for an equal addi-
tion of heavy water. The addition of light water
caused greater increases in flame velocity with
equilibrium hydrogen-atom concentration than would
be predicted by the Tanford and Pease square-root
relation. The ratio of the flame velocity of a mix-
ture containing light water to that of a mixture con-
taining heavy water was found to be 1.4. This value
is the same as the ratio of the reaction rate of hydro-
gen and oxygen to that of deuterium and oxygen. A
ratio of reaction rates of 1.4 would also be required
for the square-root law to give the observed ratio of
flame-velocity changes.

NACA RM E53L14

VAPOR PRESSURES AND CALCULATED HEATS OF
VAPORIZATION OF CONCENTRATED NITRIC ACID
SOLUTIONS IN THE COMPOSITION RANGE 71 TO
89 PERCENT NITRIC ACID, 7 TO 20 PERCENT
NITROGEN DIOXIDE, 1 TO 10 PERCENT WATER,
AND IN THE TEMPERATURE RANGE 10° TO 60° C.
A. B. McKeown and Frank E. Belles. February
1954. 20p. diagrs., 2 tabs. (NACA RM E53L14)

Total vapor pressures were measured for 16 acid mixtures of the ternary system nitric acid, nitrogen dioxide, and water within the temperature range 10° to 60° C and within the composition range 71 to 89 weight percent nitric acid, 7 to 20 weight percent nitrogen dioxide, and 1 to 10 weight percent water. Heats of vaporization were calculated from the vapor pressure measurements for each sample for the temperatures, 25°, 40°, and 60° C. The ullage of the apparatus used for the measurements was 0.46. Ternary diagrams showing isobars as a function of composition of the system were constructed from experimental and interpolated data for the temperatures 25°, 40°, 45°, and 60° C and are presented herein.

NACA TM 1356

EXPERIMENTAL DETERMINATION OF LOCAL AND MEAN COEFFICIENTS OF HEAT TRANSFER FOR TURBULENT FLOW IN PIPES. (Eksperimental'noe Opredelenie Lokal'nykh i Srednikh Koeffitsientov Teplootdachi Pri Turbulentnom Techenii Zhidkosti v Trubakh). I. T. Aladyev. February 1954. 18p. diagrs., 3 tabs. (NACA TM 1356. Trans. from Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, no. 11, 1951, p. 1669-1681).

Heat-transfer coefficients were determined for the flow of water through a heated pipe. The local heat-transfer coefficient was found to decrease along the length of the pipe up to a distance of about 40 diameters from the entrance. Equations are given for the local and mean heat-transfer coefficients as functions of the Reynolds number, Prandtl number, and length of the pipe in diameters.

BRITISH REPORTS

N-27001*

Royal Aircraft Establishment (Gt. Brit.)
CORROSION TESTS ON DIFFERENT CLADDING MATERIALS ON ALUMINIUM ALLOY SHEETS. C. Braithwaite. June 1953. 17p. photos., diagrs., 5 tabs. (RAE Tech. Note Met. 171)

The corrosion resistance of different claddings on Al-Zn-Mg and Al-Cu-Si-Mg core material was investigated after 2 years' exposure to sea water spray. The claddings were aluminum, manganese-aluminum, zinc-aluminum, and magnesium-silicon-aluminum.

N-28109*

Aeronautical Research Council (Gt. Brit.)
THE DETERMINATION OF TURBULENT SKIN FRICTION BY MEANS OF PITOT TUBES. J. H. Preston. March 31, 1953. 31p. diagrs. (ARC 15,758; FM 1883)

A simple method of determining local turbulent skin friction has been developed which utilizes a round pitot tube resting on the surface. Assuming the existence of a region near the surface in which conditions are functions only of the skin friction, the relevant physical constants of the fluid and a suitable length, a universal nondimensional relation is obtained for the difference between the total pressure recorded by the tube and the static pressure at the wall, in terms of the skin friction. This relation is independent of the pressure gradient and surface condition.

N-28249 *

Royal Aircraft Establishment (Gt. Brit.)
THE CHEMISTRY OF SOME COMPLEX ZINC AND CADMIUM CHROME PIGMENTS. H. G. Cole and L. F. Le Brocq. September 1953. 35p. diagrs., photos., 8 tabs. (RAE Met. 75)

By means of pH curves obtained during the progressive addition of alkali to the dichromates of zinc and cadmium, conditions have been found for the formation of double alkali basic chromates of zinc and cadmium with sodium, potassium, and ammonium, and for the decomposition of these compounds by further action of alkali to basic zinc and cadmium chromates. The identity of each compound has been characterized by equation of formation, composition, X-ray diffraction pattern, and solubility. Many of these compounds are of commercial importance as paint pigments.

N-28250*

Royal Aircraft Establishment (Gt. Brit.)
THE INFLUENCE OF SUB-STRUCTURE ON THE SLIP OBSERVED IN PURE ALUMINIUM AND SOME ALUMINIUM ALLOYS. P. J. E. Forsyth and C. A. Stubbington. October 1953. 14p. diagrs., photos. (RAE Met. 76)

Observations have been made on the modifying effects of substructure on subsequent fatigue deformation both at room and subzero temperatures. Substructures produced by cold rolling altered completely the appearance of the deformation that occurred under subsequent fatigue stresses. A self-annealing process occurred in cold-rolled pure aluminum when subjected to cyclic stresses. It is concluded that fatigue stresses by virtue of their cyclic nature aid the polygonization process in pure aluminum and in certain aluminum alloys and may produce very sharply defined boundaries by a process of crystallite growth.

N-28251*

Royal Aircraft Establishment (Gt. Brit.)
THERMODYNAMIC CHARTS FOR THE DECOM-POSITION PRODUCTS OF 80% HYDROGEN PEROX-IDE. Enid Carter. October 1953. 9p. diagrs. (RAE Tech. Note RPD 88)

Thermodynamic charts giving enthalpy, entropy, and specific volume have been constructed for the decomposition products of 80-percent hydrogen peroxide (HTP), for regions above and below the saturation line. The gas velocity and venturi nozzle area can be easily deduced from the enthalpy-specific volume chart by means of a rider scale, which is also enclosed with this note.

N-28255*

Royal Aircraft Establishment (Gt. Brit.)
AIRCRAFT STRUCTURAL RESEARCH: A CRITICAL
SURVEY. D. Williams. October 1953. 7p. (RAE
Structures 156)

This report is a reproduction for official use of the
author's "feature article" in "Applied Mechanics
Reviews" for August 1953. After reviewing the
progress of structural research in recent years, it
calls attention to some of the major problems that
still challenge workers in this field.

N-28256*

Royal Aircraft Establishment (Gt. Brit.)
ON THE STRENGTH OF POLYCRYSTALLINE AND
SINGLE CRYSTAL CORUNDUM. Elizabeth A.
Jackman and J. P. Roberts. August 1953. 14p.
diagrs., photos. (RAE Tech. Note Met. 172)

The strength in bend of polycrystalline and single
crystal corundum was studied between room temper-
ature and 1,300° C.

N-28257*

Royal Aircraft Establishment (Gt. Brit.)
A METHOD OF PRODUCING HARD SURFACES ON
ALUMINIUM AND ITS ALLOYS BY ANODIC
OXIDATION. E. G. Savage and E. G. F. Sampson.
August 1953. 12p. diagrs., 3 tabs. (RAE Tech.
Note Met. 173)

The potential value of relatively thick and hard oxide
coatings on aluminum and aluminum alloys led to ex-
periments to determine the conditions under which
such coatings, 0.001 inch or more thick, could be
produced. It was found that aluminum and a number
of aluminum alloys could be successfully treated
under one set of conditions in a cooled sulphuric acid
electrolyte. Film thickness and abrasion tests were
made on the anodised samples and an anodised shaft
was run in a steel bearing with promising results.
There should be many uses for hard anodised parts,
particularly where lightness and wear-resistance are
important and where point or line loading or high
resistance to fatigue are not required. It is proposed
to make a short series of Wöhler-type fatigue tests on
hard-anodised material to specification D.T.D.364.

N-28258*

Royal Aircraft Establishment (Gt. Brit.)
FATIGUE TESTS ON SPECIMENS FROM ALUMINIUM
ALLOY D.T.D.683 'Z' SECTION EXTRUSIONS. M. S.
Binning and J. T. Ballett. September 1953. 17p.
diagrs., 3 tabs. (RAE Tech. Note Met. 179)

Fatigue tests have been made on extruded 'Z' section
stringers in high strength aluminum alloy D.T.D.683,
to discover if a surface effect detrimental to fatigue
strength is present, similar to that found in extruded
stringers of aluminum alloy to D.T.D.364. Tests
were made in fluctuating tension in high fatigue
machines, to determine the effect of surface finish
and stress raisers. It has been confirmed that a

surface effect is present with D.T.D.683 extrusions.
Polishing the extruded surface resulting in an in-
crease of 30 percent in fatigue strength, bringing the
fatigue/tensile strength ratio to the same order as
that for polished bar to the same specification. When
a stress raiser in the form of a hole is present,
polishing has little effect but radiusing the edges of
the hole increases the fatigue strength by 30 percent.

N-28259*

Royal Aircraft Establishment (Gt. Brit.)
THE KINETICS OF THE CHEMICAL REACTION BE-
TWEEN A SOLID AND A GAS STREAM MOVING
OVER IT. L. G. Carpenter. October 1953. 6p.
(RAE Tech. Note Met. 182)

Based upon the kinetic theory of gases, a simple
approximate treatment is given, which shows how the
reaction rate is controlled by both chemical and
diffusional resistance, and enables the relative im-
portance of these terms to be calculated.

N-28260*

Royal Aircraft Establishment (Gt. Brit.)
THE EFFECT OF HEAT AND MOISTURE ON THE
TENSILE STRENGTH OF SURFACE-TREATED
GLASS FIBRES. R. B. King and E. W. Russell.
September 1953. 10p. 4 tabs. (RAE Tech. Note
Chem. 1203)

The tensile strength after heat treatment of single
high and low alkali glass fibers was examined. The
influence of surface agents in reducing the attack of
moisture on the glass was also studied. Permanent
weakening was sustained with temperatures above
250° C. Of the surface finishes investigated, vinyl
trichlorosilane was found to be the most effective.
Most of the other treatments showed little or no
improvement over control values.

N-28263*

Royal Aircraft Establishment (Gt. Brit.)
MODEL TESTING TECHNIQUE EMPLOYED IN THE
R.A.E. SEAPLANE TANK. T. B. Owen, A. G.
Kurn and A. G. Smith. September 1953. 87p.
diagrs., photos., tab. (RAE Aero 2505)

A description is given of the various techniques
evolved in recent years to provide model data as a
basis for predicting the full-scale behavior of a sea-
plane. The apparatus available at the time of writing
is described and also the methods of design and con-
struction of the models used to measure water and
air forces, and the dynamic behavior in pitch, heave,
and yaw.

N-28265*

Aeronautical Research Council (Gt. Brit.)
THE BIOLOGY OF FLYING. REPORT OF A
SYMPOSIUM HELD AT THE BRITISH ASSOCIATION
MEETING IN BELFAST, SEPTEMBER, 1952.
May 21, 1953. 15p. (ARC 15, 927; EP 240)

Papers are given on Civil Air Transport Problems by K. G. Bergin, Physiological Problems of High Performance Military Aircraft by W. K. Stewart, Skill and the Airman by W. E. Hick, and Engineering Problems of Conditioning Aircraft for Human Occupation and Control by D. G. A. Rendel.

N-28404*

Royal Aircraft Establishment (Gt. Brit.)
AN ELECTRONIC TRIP TO PREVENT OVERSPEED-ING OF A TURBO-ALTERNATOR. D. S. Dean. November 1953. 8p. diagrs. (RAE Tech. Note RPD 91)

A circuit is described which will cut off the fuel supply to a turbine driven alternator when the output of the alternator reaches a predetermined frequency, and thus prevent damage to the unit due to overspeed-ing. The circuit also incorporates a manual emer-gency stop which may be operated at any turbine speed. The particular unit described has been de-signed to operate at any frequency between 2350 and 3000 cycles/second depending upon the setting chosen before the run. It will operate at the same frequency with any input between 2 and 150 volts and is unaffected by the harmonic content of the input signal. The setting is stable to within ±10 cycles/second over a period of weeks.

N-28405*

Royal Aircraft Establishment (Gt. Brit.)
TRANSIENT TEMPERATURE DISTRIBUTION IN AN INFINITE FLAT PLATE WITH RADIAL HEAT FLOW. S. W. Green. October 1953. 24p. diagrs. (RAE Tech. Note RPD 92)

The temperature distribution in an infinite flat plate originally at uniform temperature has been calcu-lated for prescribed rates of heat transfer across the boundary of a circular hole in the plate. Heat trans-fer with constant heat-transfer coefficient from a source at constant temperature has been assumed, and the calculations have been made for a range of values of the heat-transfer coefficient.

N-28406*

National Gas Turbine Establishment (Gt. Brit.)
OUTLINED GENERAL TREATMENT OF THE CAL-CULATION OF WAVE EFFECTS DUE TO SMALL DISTURBANCES OF STEADY STABILISED BURNING. PART II. P. W. H. Howe. July 1953. 39p. diagrs., 2 tabs. (NGTE R. 135)

The reaction of a region of steady burning to small disturbances (for example, in the fuel supply) is con-sidered. Equations are given for a law of burning such that the rate of change of entropy of a gas par-ticle is proportional to the fuel concentration. It is established that there is a fairly close connection between the pressure pulses produced up to a certain time and extra energy released up to that time. If increased turbulence contributes to the extra heat, release "humped" pressure pulse profiles are ob-tained.

N-28409*

Marine Aircraft Experimental Establishment (Gt. Brit.) SOME NOTES ON THE CALCULATION OF PRESSURE PICK-UP SENSITIVITY AND THE CON-DITIONS FOR MAXIMUM SENSITIVITY. J. K. Friswell. November 1953. 36p. diagrs. (MAEE F/Res/235)

A theoretical analysis is made of the sensitivity of a pressure pickup of the strain-gaged cantilever type and of the conditions for maximum sensitivity. Two different configurations are treated and the effect of tension in the diaphragm is also considered. An account is given of experiments carried out in order to verify the analysis and to observe the behavior outside the range of validity of the theory. Sugges-tions are made for practical pickup design based on both theory and experiment.

MISCELLANEOUS

NACA TN 2012

Addendum No. 1 on "RESULTS OF SHEAR FATIGUE TESTS OF JOINTS WITH 3/16-INCH-DIAMETER 24S-T31 RIVETS IN 0.064-INCH-THICK ALCLAD SHEET." Marshall Holt. February 1950.

N-29154

National Advisory Committee for Aeronautics.
LIST OF TECHNICAL MEMORANDUMS, 1947-1953. 1954. 8p. (NACA)

N-29155

National Advisory Committee for Aeronautics.
LIST OF TECHNICAL NOTES, 1947-1953. 1954. 147p. (NACA)

UNPUBLISHED PAPERS

N-6535*

National Bureau of Standards.
EFFECT OF HOT DIMPLING ON THE CORROSION OF ALUMINUM ALLOYS 75S-T6 AND ALCLAD 75S-T6. Fred M. Reinhart and Hugh B. Hix. February 27, 1951. 13p. photos., 2 tabs. (National Bureau of Standards)

This investigation was initiated to determine whether the hot dimpling of 75S-T6 and Alclad 75S-T6 alumi-num alloys to accomodate A17S-T4, 100° counter-sunk rivets adversely effected the corrosion resist-ance of these materials.

N-27944*

National Bureau of Standards.
PROTECTIVE VALUE OF CHROMIUM PLATE ON
TYPE 410 STAINLESS STEEL IN MARINE AND
URBAN ATMOSPHERES AND IN TIDEWATER. Fred
M. Reinhart and David B. Ballard. April 6, 1953.
12p. photos., tab. (National Bureau of Standards.
Rept. 2406)

An investigation was conducted to determine whether
chromium plated type 410 stainless steel could be
substituted for type 316 stainless steel for some
corrosive conditions in aircraft and whether chromi-
um plating would increase the life of type 410 stain-
less steel. The chromium plate discolored and the
underlying steel rusted within 3 months of exposure
in urban and marine atmospheres and within 6 months
in tidewater.

N-27946*

National Bureau of Standards.
CORROSION OF COMMERCIAL MAGNESIUM
ALLOYS. Fred M. Reinhart. May 26, 1953. 25p.
photos., 4 tabs. (National Bureau of Standards.
Rept. 2519)

An investigation was conducted to determine the
relative susceptibilities of all the commercially
available magnesium alloys with different surface
treatments, both painted and unpainted, to corrosion
in marine atmosphere and tidewater environments.
The surface coatings on all of the magnesium alloys
failed within 24 months after exposure in the marine
atmosphere. Paint afforded protection to the
majority of the alloys for 12 months in the tidewater.
The surface coatings served as good bases for paint
for at least 24 months of exposure in the marine
atmosphere.

N-27947*

National Bureau of Standards.
PROTECTIVE COATINGS FOR LOW CARBON
STEEL. Fred M. Reinhart and David B. Ballard.
December 2, 1952. 7p. photo. (National Bureau of
Standards. Rept. 2087)

A project has been initiated to determine the protec-
tive value of cadmium plate, Dimetcote No. 2,
Zincilate No. 100, and Zincilate No. 300 coatings on
low carbon steel in urban and marine atmospheres
and in tidewater. After 3 months exposure the
Cadmium coating gave no signs of failure; the
Dimetcote No. 2 showed indications of incipient fail-
ure in urban atmosphere only; Zincilate No. 100
showed beginning of failure in tidewater only;
Zincilate No. 300 failed by blistering in tidewater.
Rusting at the bottom of scratches through the coat-
ing occurred in all environments. This report
covers one phase of a general investigation.

N-27948*

National Bureau of Standards.
ANODICALLY SURFACE TREATED AND PAINTED
CAST MAGNESIUM ALLOY AZ63A-T6. Fred M.
Reinhart. June 1, 1953. 13p. 2 tabs., photo.
(National Bureau of Standards. Rept. 2533)

Results are given of a study of the effect of some
variables associated with surface treatments such as
composition of bath, time of treatment, conditions of
electrolysis, surface pretreatments, and sealing
treatments on the adhesion of paint and the protec-
tion afforded by the paint against corrosion in a
marine atmosphere. The adhesion of different paint
coatings to the anodically surface coated panels was
excellent for 184 months of exposure in the marine
atmosphere.

DECLASSIFIED NACA REPORTS

NACA RM 52F19

DEVELOPMENT OF METAL-BONDING ADHESIVE
FPL-710 WITH IMPROVED HEAT-RESISTANT
PROPERTIES. John M. Black and R. F. Blomquist,
Forest Products Laboratory. July 8, 1952. 10p.
2 tabs. (NACA RM 52F19) (Declassified from
Confidential, 1/22/54)

An adhesive, FPL-710, has been developed that pro-
duces higher strength at temperatures up to 600° F
than heretofore obtained and possesses good resist-
ance to aging at temperatures as high as 450° F. The
adhesive also has acceptable resistance to creep and
to immersion in various organic solvents. The prep-
aration and recommended bonding procedures are
described.

THE FOLLOWING REPORT
HAS BEEN DECLASSIFIED FROM
CONFIDENTIAL, 1/8/54.

   RM L7I05

THE FOLLOWING REPORTS
HAVE BEEN DECLASSIFIED FROM
RESTRICTED, 12/14/53.

      ACR E5H23
      ACR E6D05